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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/643,061
Filing Date: August 18, 2003
Appellant(s): MATHIAS ET AL.

EXAMINER'S ANSWER

This is in response to the appeal brief filed July 23, 2007 appealing from the Office action mailed November 28, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,010,606	Denton et al.	1-2000

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-10 are rejected under 35 U.S.C. 102(b) as being anticipated by Denton et al. (US Patent 6,010,606).

In regard to claims 1 and 2, the Denton et al. reference teaches a PEM fuel cell (Column 1, Line 37) having an electrode plate with flow field to distribute reactant gases (Column 6, Lines 32-36), a MEA and gas diffusion electrode plates (Column 1, Line 42). The Denton et al. reference discloses dimensionally stable (rigid) and highly flexible gas diffusion electrodes (Column 4, Lines 33-34) that are electrically conductive (Column 3, Lines 56).

In regard to claims 3-5, the Denton et al. reference discloses fibres within the matrix are oriented in the –x, and -y, with additional random orientation in the –z plane with inclusions of very short fibres with lengths of ≤2mm or very fine fibres with diameters of ≤1μm out of a range of 0.2 μm to 50 μm. It is also possible to introduce anisotropic character into the fibre matrix by using longer fibres, typically ≤50 mm (Column 3, Lines 40-49).

In regard to claims 6-8, the Denton et al. reference discloses gas diffusion electrodes are made of graphite surfaces (Column 2, Line 9-13). It is known in the art that graphite is a form of carbon.

In regard to claims 9 and 10, the Denton et al. reference teaches catalyst components such as metal or metal supported on carbon in the form of highly surface area are finely divided fibers (Applicant's strip; Column 3-4, 55-67 and 1-4 respectively). The reference further addresses that these metals can be stainless steel (Column 2, Line 40)

(10) Response to Argument

A) The Applicants argue, "*The Denton patent does not anticipate claims 1-10 because the Denton diffusion media is flexible regardless of direction, and thus the Denton patent does not teach or disclose a PEM fuel cell comprising diffusion media rigid along a transverse axis. It is an object of the Denton reference to provide a gas diffusion electrode with both increased dimensional stability and flexibility. Denton col. 3, lines 7-9; and col. 4, lines 32-35. The electrode may be formed by taking a non-woven fiber material and applying a catalyst coating that includes catalyst and polymeric material to form a flexible matrix. Denton col. 4, line 66 to col. 5, line 3; and see Denton claims 1, 16, 32, 48, and 49. The Denton teachings are said to overcome a major problem with conventional gas diffusion electrodes, in that conventional electrodes lack flexibility and are easily damaged on handling. Denton col. 2, lines 50-55; col. 3, lines 6-9. Compare, for example, the rigid conventional-type electrodes of "pre-teflonated" conducting carbon fiber paper with the Denton electrode. Denton col. 6, lines 22-29. As such, Denton teaches flexible electrodes.*

Notably, there is no directionality associated with the flexible Denton gas diffusion electrode. The electrode appears to be highly flexible regardless of axis and orientation. Moreover, nowhere does Denton discuss directionally in any physical properties of the electrode, much less attribute opposite characteristics such as flexible and rigid, between a transverse and a lateral axis of the electrode and an associated flow field.

The only mention of directionality regarding the Denton disclosure is in reference to the fibers. The Denton electrode is made of non-woven fibers, and the fibers themselves may be isotropic or anisotropic, depending on their alignment. Denton col. 3, lines 40-50. For example, methods of laying down the layer can impart a directional force (e.g., by extrusion) which can align fibers. Denton col. 3, lines 45-50. However, the overall Denton electrode is dimensionally stable but highly flexible. Denton col. 3, lines 40-51; col. 4, lines 32-34; and see Denton independent claims 1, 16, 32, 48, and 49 all pertaining to a flexible layer of non-woven fibers. No benefit, effect, or property is attributed to either randomly oriented or anisotropic fibers. Fiber orientation appears to simply be a product of the fabrication method.

In contrast, the present claims are drawn to a fuel cell in which the diffusion media has rigid transverse axis crossing the channels of the flow field. Denton teaches away from a rigid axis, teaching an electrode said to be highly flexible. To anticipate a claim the reference must teach every element of the claim. Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628,631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). In the present case, the Denton reference fails to disclose all the features of Appellant's claims and, therefore, is not an anticipatory reference. "

The Applicants argue, "*The Denton patent uses the term "dimensionally stable" to mean a diffusion media that is not stretchable, Denton col. 4, lines 32-35; col. 3, lines 7-9, not as the Examiner alleges, to mean rigid. "Dimensionally stable" in Denton refers to the resistance of the electrode to planar dimensional*

change (in the x and y directions) due to stretching. Denton col. 2, lines 56-60. In fact, Denton recognizes a major problem with conventional gas diffusion electrodes based on woven cloth substrates is that they lack good dimensional stability as the cloth can be stretched in the x and y directions. Denton col. 2, lines 56-60. Denton's solution is a flexible electrode resistant to stretching. As such, Denton identifies "flexibility" and "dimensional stability" as both properties of its diffusion media that are advantageous compared to rigid and stretchable conventional electrodes.

Denton's dimensional stability therefore has nothing to do with rigidity. Denton discloses that "dimensional stability" only refers to stretching resistance. The Denton teachings do not support the Examiner's statements in the Office Action mailed November 28, 2006 at the top of page 5, where the Examiner appears to allege that dimensional stability comports with rigidity. Such an inference is not supported by the use of the term in the Denton specification. Denton is expressly trying to overcome the rigidity of the conventional electrodes. Cf. Denton col. 6, lines 22-29 and col. 2, lines 50-52 versus col. 3, lines 6-9 and col. 4, lines 32-34.

Denton's unstretching diffusion media is flexible not rigid. An analogous material that is both highly flexible and dimensionally stable, as defined in Denton, is a piece of paper - it can be rolled or bent anywhere along its planar surface, as it is highly flexible, but it cannot be stretched within its x and y dimensions (i.e., planar surface). However, a piece of paper is not rigid. Consequently, the statement on pages 4 to 5 of the final Office Action that "if one

cannot easily stretch an object it would [sic] stable" is correct, but this statement and the language used in Denton have nothing to do with rigidity.

The Denton electrode cannot be both flexible and rigid. Dimensionally stable, as used in Denton, does not require rigidity. In contrast, Appellants' rigid transverse axis avoids tenting. Page 10, line 27 to page 11, line 5; and see Advisory Action mailed March 9, 2007. As a result, the presently claimed diffusion media will not impinge or tent into the flow channels along the rigid transverse axis (i.e., the x-direction) as it is sufficiently stiff. Page 8, line 41 to page 9, line 13; and see the stippled line in FIG. 3, reproduced in the Summary of Claimed Subject Matter above.

In the Advisory Action from March 9, 2007, the Examiner misconstrues "dimensionally stable," (i.e., resistant to stretching), as synonymous with "avoiding tenting," and consequently draws the mistaken inference that "dimensionally stable" is the same as "rigid". However, the use of the verb form of "tent" in the present specification has nothing to do with stretching ability. "To tent" into the channels does not require that the diffusion media stretches; in the present specification it simply means that it will not impinge into the channels. Page 8, line 41 to page 9, line 13. The Examiner's reasoning is contradictory to the ordinary and customary meaning of these words.

Finally, in the present case it is improper to import terms from the Lawheed reference (U.S. Patent 6,672,064) as done by the Examiner on page 5 of the Office Action mailed November 28, 2006. There is no ambiguity regarding the definition of "dimensionally stable" in Denton. Denton expressly uses

"dimensionally stable" to refer to a material's resistance to stretching. Denton col. 2, lines 56-60. As such, there is no reason to import alternative meanings for "dimensionally stable" from other references. Compare, Renishaw PLC v. Marposs Societa' per Azioni, 158 F.3d 1243, 1250, 48 USPQ2d 1117, 1122 (Fed. Cir. 1998) ("Where there are several common meanings for a claim term, the patent disclosure serves to point away from the improper meanings and toward the proper meanings."); and see Phillips v. AWH Corporation, F.3d 1303, 1313, 75 USPQ2d 1321, 1326 (Fed. Cir. 2005) (en banc).

Denton does not anticipate Claims 1-10. These claims are drawn to a PEM fuel cell comprising permeable diffusion media that is rigid along a transverse axis crossing the channels of the flow field. Denton is silent as to this feature, and in fact, the Denton electrode is highly flexible without regard to axis or direction. As Denton is missing this feature the reference cannot anticipate claims 1-10."

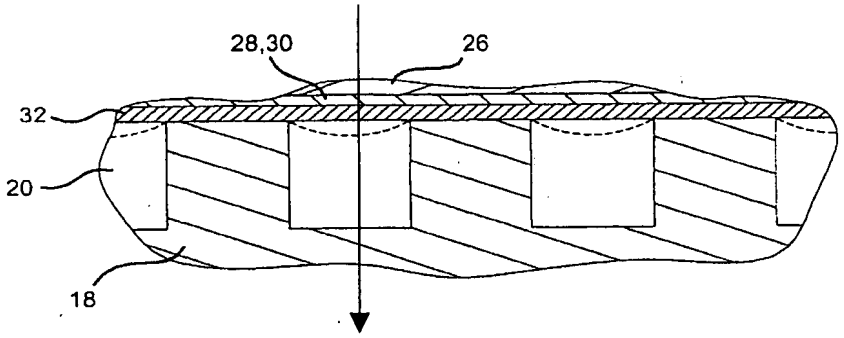
In response to Applicants arguments, The Denton et al. reference discloses a dimensionally stable and flexible gas diffusion electrode. The invention disclosed by Denton et al. reference has flexibility and dimensionally stable along both the -x and -y-axis (in this case isotropic) but also discloses anistropic properties (Column 3, 40-50). The term "comprising" in claim 1 means to have limitations of the claimed language and in addition to. Though the claimed recitation requires that the lateral axis has to be flexible and the transverse axis has to be rigid, there are no limitations that lateral axis cannot also be rigid and the transverse axis cannot also be flexible. Therefore, if the

lateral axis and the transverse axis are both dimensionally stable and flexible (isotropic properties), the claimed invention holds no novelty over the prior art.

The Applicants than argued using a piece of paper as a reference that it may be rolled or bent anywhere along its planar surface, as it is highly flexible but it cannot be stretched within its x and y dimensions, however, a piece of paper is not rigid. These arguments are mere assertions of which the Applicants. The example used is purely subjective in that the Applicants may not think that the piece of paper is rigid, however, the Examiner can take the position that the paper is still rigid to an extent.

Also, the Denton et al. reference discloses the conventional gas diffusion electrodes lacks flexibility due to rigid substrates or lacks good dimensional stability (by example of stretching the gas diffusion electrode). Thus to solve this problem the Denton et al. reference presents gas diffusion electrodes that are flexible but yet can retain its dimensions so that the gas diffusion electrode cannot be easily stretched in the major planar faces x and y (Column 2, Lines 55-60). Clearly if one cannot easily stretch an object it would be rigid. The Applicants also defines the term "rigid" is to avoid tenting in Paragraph 29 of Specification submitted on August 18, 2003. Tenting is defined by one of ordinary skill in the art as stretching. If the disclosure of Denton et al. discloses "dimensionally stable" is to avoid stretching and the Applicants disclosure of "rigid" in Paragraph 29 is to avoid tenting and by one of ordinary skill tenting is meant stretching than the meaning of "rigid" by the Applicants and "dimensionally stable" disclosed by

Denton is the same. The Applicants than argue that the verb form "tent " in the present specification has nothing to do with stretching ability and that it simply means that it will not impinge into the channels as shown in Figure 3. Please now refer to Figure 3 below



The arrow represents a directional force in the diffusion media caused by pressure. The diffusion media is stretched in the downward direction caused by pressure, this stretching or tenting causes the impingement of the flow channels. Whether the Applicants desire to refer this phenomenon as tenting or impingement, the diffusion media is stretched in the direction by the arrow caused by pressure.

In addition, as noted above, the Denton et al. reference discloses the gas diffusion electrode is "dimensionally stable" or cannot be easily stretched in the major planar faces x and y (Column 2, Lines 55-60). Please note that "dimensionally stable" or cannot be easily stretched is a characteristic of the major planar faces of x and y-axis. The Denton et al. further includes the fibres, within the matrix, are normally randomly oriented in the x and y direction (in-plane) producing a two dimensionally isotropic structure... It is also possible to introduce anistropic character (different characteristics i.e. in this case

"dimensional stability" or Applicant's "rigidity") into the fiber matrix by using longer fibres typically ≥ 50nm, in composition with any method of laying the layer that imparts a directional force into the mixture (Column 3, Lines 40-50).

Furthermore, as noted above, the Denton et al. reference disclose it is also possible to introduce anistropic character into the fiber matrix by using longer fibres typically ≥ 50nm, in composition with any method of laying the layer that imparts a directional force into the mixture (Column 3, Lines 40-50). This disclosure is the same as Paragraph 29 of specification submitted by the Applicants on August 18, 2003 stating "the mechanical properties of the diffusion media 32 are different in the x- and y-direction (i.e. anistropic) to achieve the flexibility and rigidity (to avoid tenting) requirements.

The Applicants also argues that fiber orientation appears to simply be a product of the fabrication of method. Again, these arguments are mere assertions of the Applicants. The Denton et al. also discloses the longer fibres typically ≥ 50nm is part of the composition for the fiber matrix in order to create anistropic characteristics.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Helen O. Chu

PATRICK JOSEPH RYAN
SUPERVISORY PATENT EXAMINER

Conferees:

W. Krynski